HEWLETT PACKARD

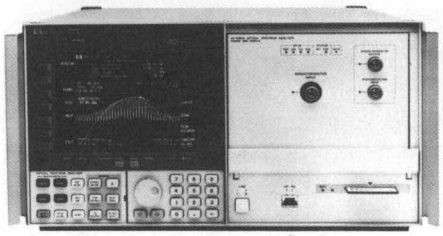
BENCH BRIEFS

SERVICE INFORMATION FROM HEWLETT-PACKARD

2nd, 3rd & 4th Quarters 1993

The Optical Spectrum Analyzer - Part 2 HP OSA Measurement Modes and the Noise Floor

Richard Ogg/Hewlett-Packard



Introduction

In the previous issue of *Bench Briefs* I explained the difference between the optical spectrum analyzer and the lightwave signal analyzer. I covered modulation and some basic operation of the OSA. In this issue I will describe several different types of measurement or operating modes, and describe the noise floor: what causes it and how OSA noise is different from conventional microwave spectrum analyzers.

Signal Processing

First it is necessary to understand the basic block diagram shown in Figure 1. Optical tuning and resolution is accomplished in the monochromator. The selected optical signal is coupled back onto fiber and normally passes through the transfer switch to the photodetector diode. Here the optical power is converted to an electrical current. The transimpedance amplifier not only amplifies the signal according to variable gain, but changes the signal from a current to a voltage. (This is where the "trans-" portion of the name comes from.) The signal is then digitized and processed using DSP techniques.

Now, on to the operating modes. These are provided by the transfer switch and the transimpedance switch. There are a total of five modes with the first being an OSA. Each of the other four descriptions follow.

Preselector Mode

The preselector mode uses the monochromator input and the monochromator output. The monochromator is used as a tunable bandpass filter with variable bandwidth. This allows selection of a single mode from a Fabry-Perot (FP) laser, or an individual signal from a wavelength-divi-

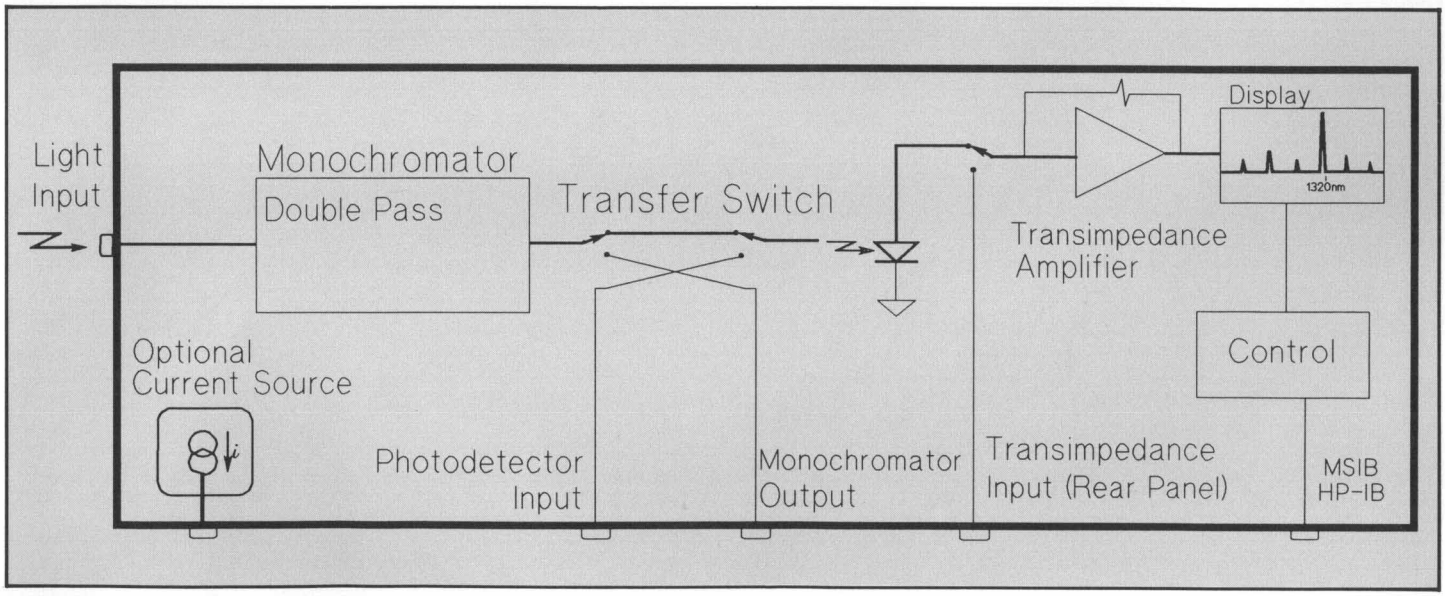


Figure 1. Basic OSA Block Diagram

Pub. No. 5952-3464

sion multiplexed system. The output is on 62 μm fiber and would be analyzed further by other equipment. This mode can be used as a "lightwave sweeper" if a broadband signal, such as a white-light source, is applied to the input. In this case the output is light at the monochromator-tuned wavelength, with a width equal to the resolution.

Stimulus-Response Mode

The stimulus-response mode uses all three ports on the front panel. Generally a white-light source is connected to the monochromator input to form a "sweeper" as described above. The monochromator output is connected to the two-port device under test (DUT), with its output connected to the photodetector input. As the OSA sweeps it stimulates the DUT at different wavelengths, then detects the output and shows the power level on screen. The result is a plot of the insertion loss, or gain of the DUT, versus wavelength. Normalization arithmetic is provided.

Power-Meter Mode

The power-meter mode uses only the photodetector input. In this mode the OSA measures total optical power over a very wide range of wavelengths. The trace is displayed in a 10 second sweep so changes in the power level can easily be seen while adjustments are made by the user. (Accuracy is not as good as a regular optical power meter, but the wavelength range is wider.)

Photodetector Mode

The photodetector mode allows testing an external photodetector. Again, a white light source is connected to the monochromator input. The monochromator output is connected to the photodetector under test. The electrical output of the photodetector being tested is connected to the transimpedance input on the rear panel. Calibration is provided by the photodetector internal to the OSA. The resulting measurement is responsitivity versus wavelength.

The OSA Noise Floor

We begin by looking at the simplified diagram in Figure 2 that shows the basic operation of the OSA and the contribution of the components that relate to noise. As you follow the light, the first significant item is the rotating grating. This provides the wavelength spread that allows selection of a limited wavelength range. Its rotation provides the sweeping function of the analyzer. The next item is the aperture, which allows only the desired range of wavelengths to pass. It is literally a wheel with multiple slits of varying width and provides the resolution function for the OSA. This is the primary resolution bandwidth filter, providing the only resolution adjustment control. The light is returned to the grating and is eventually focused onto the fiber, providing additional resolution bandwidth filtering. The photodetector converts the light into a current and acts as the envelope detector. The signal is converted from current to voltage and amplified by the transimpedance amplifier. The signal is then digitized and further processed as shown.

Microwave vs. OSA

Now look at Figure 3, which shows the key block diagram differences. Again the block diagram is extremely simplified, but the purpose is to examine noise generation and processing in the instrument.

Microwave Analyzer Noise Generation

In the microwave analyzer, the most noise is generated in the RF section, or down conversion portion of the instrument. Because the signal next passes through the resolution bandwidth filters, these have the most significant affect on the amount of noise in the system. Reducing this filter width reduces the noise seen on the display. The electrical signal then passes through log amplifiers, which produce a signal whose amplitude is proportional to the log of the input. Envelope detection and video filter-

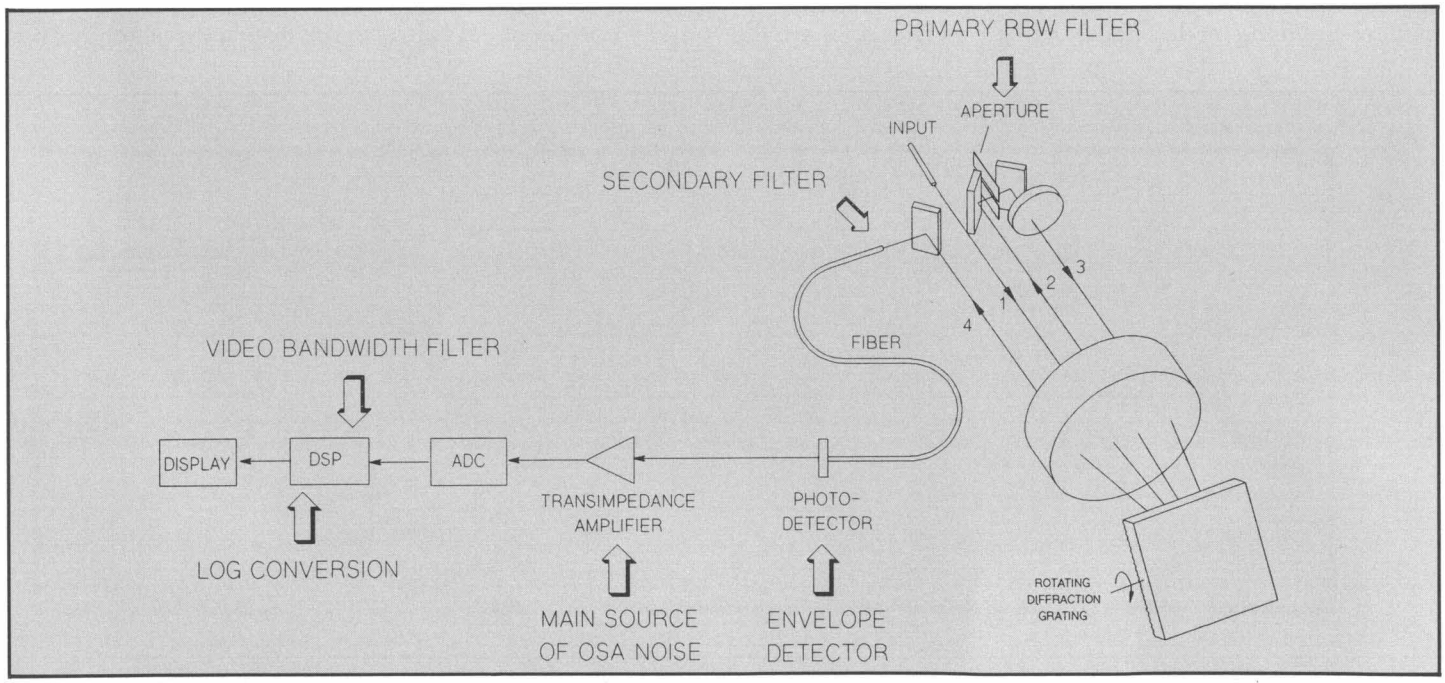


Figure 2. HP OSA Operation — Key Fundamental Blocks

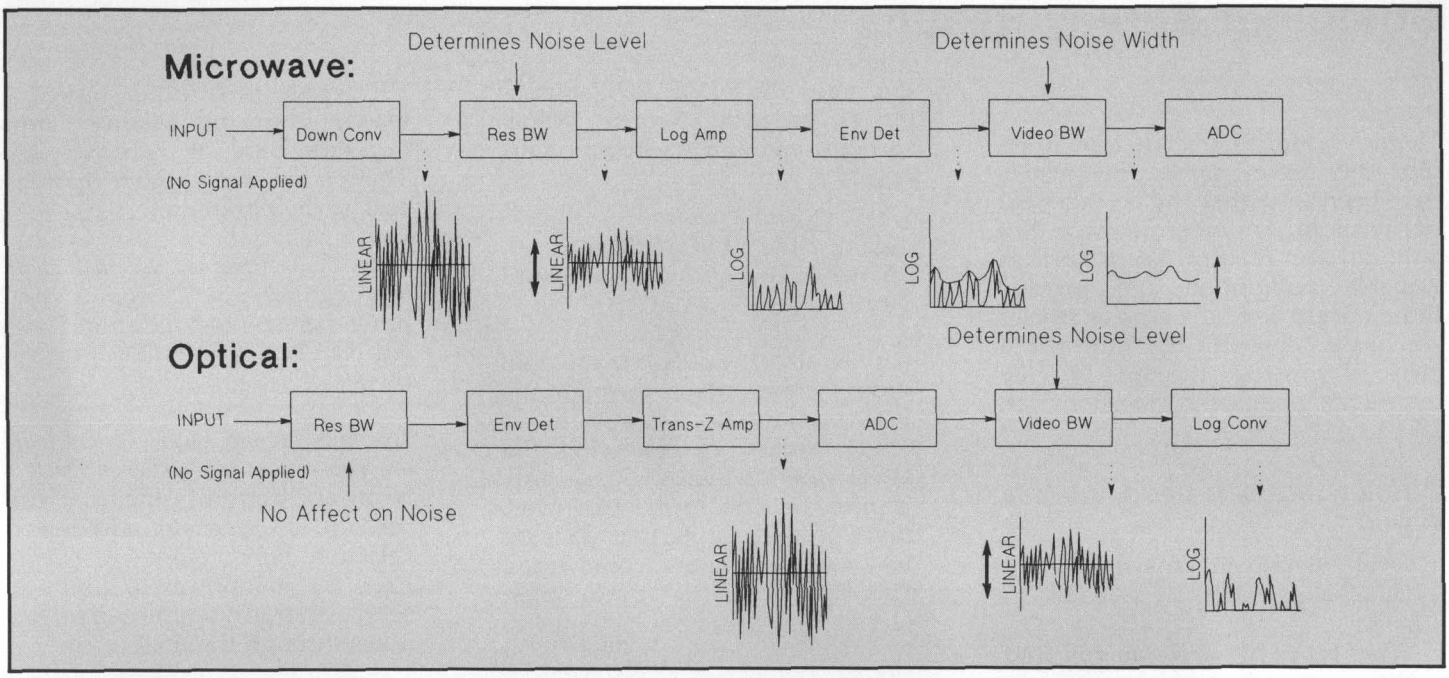


Figure 3. Noise Comparisons of Microwave and Optical Spectrum Analyzers

ing will produce a signal representative of the peaks of the noise.

OSA Noise Generation

In the optical analyzer, the process is quite different. Note that the most noise is generated in the transimpedance amplifier. This is well past the resolution bandwidth functions. Because all parts of the instrument are passive up to the photodiode, no noise is generated until there. Although the photodiode, working as the envelope detector, does generate some noise, the levels are insignificant compared to the amplifier. Therefore, the noise is shown as first appearing after the transimpedance amplifier. The signal is next digitized, then passes through video bandwidth filtering (in the digital signal processing circuits, or DSP). The final step, before being displayed, is the log conversion.

For clarification, the waveform shown at the end of the optical analyzer will not match that seen on the actual instrument. When the noise is negative, the log function makes no sense. When the noise value is close to zero, the log value is very negative. The log values actually vary between the peak value and negative infinity. For aesthetics, the trace is clipped a few dB below the sensitivity level.

Filter Control of Noise

For either instrument, the key function block for controlling the noise in the measurement is the first filter following the element that generates the most noise. In the microwave analyzer, this was the resolution bandwidth filters, and these are normally changed to reduce the noise. If the same tactic is tried on the optical analyzer, there will be no change in the noise level. For the optical analyzer, the first filter following the noise generation is the video bandwidth filter, and this is where the noise is primarily controlled.

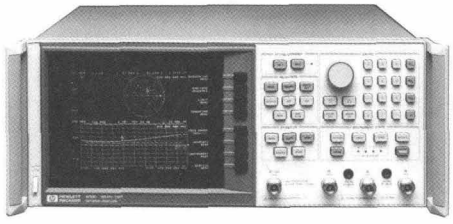
Sensitivity

At this point the HP OSA has an HP-patented feature called a "sensitivity function" that allows the user to directly enter the required sensitivity level. Internal algorithms determine proper settings of gain in the transimpedance amplifier and filtering in the video bandwidth filter to achieve the desired sensitivity.

In a future issue we will look more at sensitivity. □

Low-Frequency Antenna Measurements Using the HP 8753C Network Analyzer

John Swanstrom/Hewlett-Packard



Did you know that you can use the Hewlett-Packard 8753C Network Analyzer for antenna pattern measurements. The HP 8753C provides a low-cost low-frequency measurement system for RF antennas. *Antenna Measurements using the HP 8753C Network Analyzer* (5952-2776), available from your local HP sales/service offices, describes how to configure an HP 8753C into an antenna measurement system. The note describes the system block diagram, provides assistance for determining the range power budget, and contains information on microwave performance. The product note covers everything you need to know about HP's measurement solution.

If you want to automate the HP 8753C through a personal computer, Flam & Russel's 959 software is available. Call Flam & Russel at (215) 674-5100 for information. □

Customer Survey Results

Jim Bechtold/Editor

Thank you for taking the time to return the survey cards. The results have been tabulated and were beneficial to us in a number of ways. Not only did you reaffirm *Bench Briefs* as valuable publication and provide some insight as to the type of articles you want to see in the future, but many of you took the time to write comments about the questions we asked.

1. **How valuable is Bench Briefs to you?**

   Over 90 percent answered very valuable or extremely valuable.

2. **What types of article do you find the most useful?**

   85 percent of the cards checked technical subjects.
   80 percent of the cards checked cross references.
   70 percent of the cards checked service tips.

3. **If you could receive two additional issues per year through your FAX machine, would you request them?**

   The yes/no response to this question was about 50/50. A reader from Tektronix in Beaverton penciled in *"Maybe, if less than six pages."* It is hard to keep Bench Briefs within six pages due to the list of new service notes.

4. **Do you LIKE/DISLIKE (please circle) ordering Service Notes through your FAX machine, and why?**

   Again, the LIKE/DISLIKE response to this question was about 50/50.

   Almost all of the people that would order service notes through the FAX machine liked it because of 'quick access' or 'receiving the latest service notes,' (the only choices on the card). However, most of the people that disliked FAX service notes commented "poor paper quality" as the main factor.

   "Thermal paper curls and browns over time," wrote an Equipment Specialist in the U.S. Army at Adelphi, MD.

   FAX "does not save time and has to be copied for filing," from a reader at Pamtec Corporation.

   "Backlog of our FAX is very large," from a lab coordinator at Motorola/ Codex in Canton, MA.

   "I support several hundred HP products," wrote an engineer at Norwegian Telecom. That could be an expensive phone bill.

   "FAX line in overload mode already. Are there charges for HP FIRST and HP Service parts BBS?" asked a reader from the Marine Corps Logistics base at Albany, GA. There is no charge other than the cost of the phone call.

   "Our FAX machines use that awful heat sensitive paper," from a computer systems technician at Hewlett-Packard, Scientific Instruments Division.

   "Nothing wrong with 'service note order form' on back of Bench Briefs," wrote an electronics engineer with the U.S. Government in Redwood City, CA. Sorry, but we just don't have the manpower or funds to send out large quantities of service notes through the mail.

   Second most cited dislike was lack of a FAX machine.

   FAX paper quality did not occur to us here because we use HP's plain paper FAX machine. In all of our tests using the HP FAX-310, the quality of the text and artwork received from HP FIRST were outstanding.

5. **Personal Information.**

   Some people sent in address changes on the cards. However, in most cases the handwriting was so small that it was not legible. Please send a letter with your address changes to the editor at the address on the back page of Bench Briefs. □

1994 Customer Service Training Calendar

Sally Carstensen/Hewlett-Packard

Learn Service Skills Through In-Depth Technical Instruction

Hewlett-Packard service training courses are designed to provide in-depth technical instruction for maintenance personnel seeking the skills needed to troubleshoot, repair, and maintain HP instruments and instrument systems. Course concepts are taught through a balance of theory and practical hands-on exercises.

Ordering Instrument Service Training is easy. Simply contact your local HP Sales Representative and tell him or her which courses you wish to attend. If you require a course on an instrument or instrument system not listed on the calendar below, ask your Sales Representative if a special arrangement can be made.

Note to HP Sales Representatives: These classes are not available through 1-800-HP-CLASS. Registration is processed via the HEART system. Also, all of the following classes are being taught at the Hewlett-Packard Santa Rosa, California site, 1400 Fountaingrove Parkway, Santa Rosa, CA 95403-1799. For more information, call (707) 577-3587.

Customers that sign up for the courses listed in the following table will receive instruction on the entire product family.

Content	Dates	*Tuition per Student
HP 8593A Spectrum Analyzer	Jan 25-28	$1,400
HP 8566B Spectrum Analyzer	Feb 02-10	$2,520
HP 8562A Spectrum Analyzer	Feb 14-18	$1,800
HP 8562A Spectrum Analyzer	Jul 11-15	$1,800
HP 8593A Spectrum Analyzer	Jul 18-21	$1,800
HP 8566B Spectrum Analyzer	Jul 27-Aug 04	$1,800
HP 8720C Network Analyzer	Aug 15-23	$2,520
HP 8711A Network Analyzer	Aug 24-26	$1,080
HP 8643A Signal Generator	Sep 19-23	$1,800

8562A	8593A	8566B	8711A	8720C	8643A
8560A	8590D	8566B	8711A	8719C	8643A
8560E	8591E	8567A		8720C	8644A
8561E	8592D	8568B		8722C	8644B
8562A	8593A			8753C	8664A
8563A	8593E				8665A
8563E	8594E				8665B
	8595E				
	8596E				

Course Goals

Upon completion of these courses, bench technicians will be able to:

- Explain the operation of the spectrum analyzers to the block diagram level
- Look up information regarding the instruments in the proper section of the documentation
- Identify and replace defective printed circuit or other subassemblies, as well as make the necessary post-repair tests and adjustments
- Install and run the operation verification software
- Explain what defective assemblies are likely to generate common error messages

Format

Lectures accompanied by labs, with review quizzes. Labs compose approximately 50 percent of the seminar and provide "hands-on" troubleshooting and adjustment experience.

Prerequisites

Attendees should be familiar with spectrum analyzers, at least to the simplified block level diagram. For maximum course benefit, the student should have previous experience repairing RF/microwave spectrum analyzers and RF/microwave signal sources.

*Tuition is per student and includes all course materials and lunch daily. Tuition does not include travel, hotel, or transportation.

□

Attention HP 8920 Owners — Get E-Mail Answers to Your Service-Related Questions on HP's 8920 RF Communications Test Equipment Family

HP 8920 Service Engineering Team/Hewlett-Packard

Hewlett-Packard has always encouraged customers to contact their local Service Centers for help on service-related questions. However, for many customers this may not be convenient for a variety of reasons. Now another option exists. Customers can now send HP 8920 service questions via Internet E-mail directly to Hewlett-Packard.

To communicate with the HP 8920 Product Support Group, you will need an E-mail service connected to the International E-Mail Network (Internet). UNIX* Mail, Compuserve, Genie, and America Online are only a few of the services that provide this Internet connection as a means of sending E-Mail. Send service-related questions to the following E-Mail address:

spokane_service%21@hp1000.desk.hp.com

Note: This is not the same service as the Hewlett-Packard Parts Bulletin Board Service and Automated Telefax (1-800-635-7278).

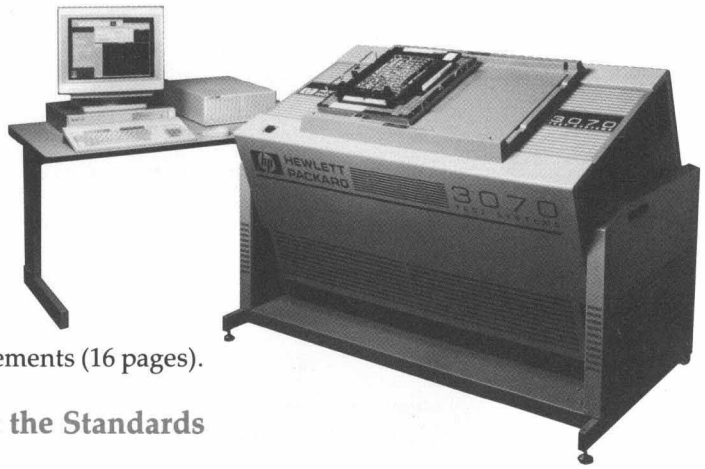
Our response-time goal is same-day or next-day reply. HP 8920 service-related questions will be read each morning and the reply should be mailed by the end of the next day. In addition, if you have comments on any aspect of your 8920 family of products, including how well you like the product, feel free to send us those as well.

*UNIX is a registered trademark of UNIX Systems Laboratories in the U.S.A. and other countries.

□

ISO 9002 and the HP 3070 Family of Board Test Systems
HP's Interpretation of ISO 9002 for HP 3070 Products

Dick Stracker/Hewlett-Packard



Introduction

Although ISO 9000 is quickly becoming a recognized method of quality certification, it does not guarantee quality products or services by itself. It is a method of documenting the processes a business uses to guarantee the quality of its product.

ISO 9000 is not a program, but a way for customers to confidently judge an organization's ability to guarantee the quality of what it produces. ISO 9000 standards are worldwide guidelines for developing a documented quality system.

These standards are not product-level standards in the sense that a label would be found on the back of a unit. The standards assess the organization that builds the product or delivers the service. Keep in mind that ISO 9000 alone will not guarantee quality. It simply documents the process a company uses.

What Are the ISO 9000 Standards?

ISO 9000 actually consists of five separate standards, each with a specific purpose. These individual standards are neither highly detailed nor voluminous. They are concise guidelines:

- ISO 9000 provides guidelines for the selection and use of quality management and quality assurance standards (6 pages).
- ISO 9001 describes a model for quality assurance in design/development, service, production, installation, final inspection, and test (7 pages).
- ISO 9002 describes a model for quality assurance in production, installation, final inspection, and test (6 pages).
- ISO 9003 describes a model for quality assurance in final inspection and test (2 pages).
- ISO 9004 provides guidelines to quality management and quality systems elements (16 pages).

Confusion About the Standards

One of the confusing parts of the standards is in nomenclature. The standards go by several names: Q-90 in the United States, BS 5750 in Britain, and EN 29000 in the EC. Table 1 shows how these national standards relate to the international ISO standards.

In the U.S., for example, the ISO 9000 standards have been adopted by the American National Standards Institute (ANSI) and the American Society for Quality Control (ASQC). Identified as the ANSI/ASQC 90-1987 series, these standards are technically equivalent to the corresponding ISO 9000 standards with substitution of American language usage and spelling.

Implementing the Standards

The key to successful ISO 9002 certification is to:

- Document what you do,
- Do what you document,
- Demonstrate proof that you're doing it (quality records).

Following is an attempt to define the Hewlett-Packard Manufacturing Test Division's stand on ISO 9002 with regard to the HP 3070 Board Test System.

An organization should seek to accomplish the following three objectives with regard to quality:

1. Achieve and sustain the quality of the product or service produced to continually meet the purchaser's stated or implied needs.

2. Provide confidence to its own management that the intended quality is being achieved and sustained.

3. Provide confidence to the purchaser that the intended quality is being or will be achieved in the delivered product or service provided. When the contract requires, this provision of confidence may involve demonstration requirements.

A common misperception in dealing with ISO 9002 is that it absolutely requires that specific conditions are met. It does require that specific categories be addressed, but it is actually quite flexible in how the categories are addressed. The standards are designed so that they can be used with almost any type of process. It might be helpful to think of

Table 1. National Equivalents to ISO 9000

International	United States	European	British
ISO 9000	ANSI/ASQC Q90	EN 29000	BS 5750 Part 0, Section 0.1
ISO 9001	ANSI/ASQC Q91	EN 29001	BS 5750 Part 1
ISO 9002	ANSI/ASQC Q92	EN 29002	BS 5750 Part 2
ISO 9003	ANSI/ASQC Q93	EN 29003	BS 5750 Part 3
ISO 9004	ANSI/ASQC Q94	EN 29004	BS 5750 Part 4

the ISO standards as a method of standardizing the documentation of unique processes.

As an example of the difference between meeting specific conditions and addressing specific categories, assume that the test department of a company uses several different types of equipment to test various products. Perhaps the company has some voltmeters (which are easily traceable to NIST standards) and some board test systems (which are not easily traceable). The ISO documentation includes a section on the processes used to maintain test equipment and this particular company might describe the maintenance of their test equipment as including periodic calibration/adjustments for the voltmeters and periodic preventive maintenance for the board test systems. Such a description would meet the ISO standards because it addresses the specific category of test equipment maintenance. However, note that it does not impose the specific condition of calibration for every piece of equipment in the test department. The ISO standards do not require that every piece of equipment in the test department be maintained in the same way and they certainly do not require calibration for all equipment.

The key to meeting ISO 9002 requirements is consistently meeting documented processes rather than meeting arbitrarily prescribed processes.

Ramifications of ISO 9002 to the Customer and the Field

Since the HP 3070 family of systems is typically used in a production environment, and since the production environment is typically the first place that companies begin to establish ISO 9002 documentation, many customers are requesting certain specific information about HP's systems. From the customer's point of view, their requests make sense because they want to include certain descriptions and requirements in their ISO documentation. From HP's point of view, it is sometimes difficult to locate and communicate the information requested by every customer, especially since each request is often unique. Thus, HP has a dilemma in terms of deciding what information we are obligated to provide to our customers in order to help them meet the ISO 9002 standards.

Do not confuse the ISO 9000 Quality System standards with the NIST Physical Measurements standards; they are two separate sets of standards.

In general, HP's position is that companies need to write their processes according to what they are now doing. Obviously, this approach should not require any new information from HP. For example, consider the equipment calibration illustration discussed in this paper. The company described in that example will not need any additional information from HP to write its ISO documentation. Its documentation will be sufficient if it simply describes the company's current operating processes, which do not include such items as calibration or special files with constants from HP.

Statements About the HP 3070

The following statements are examples of processes that can be used to help ensure that the HP 3070 family of systems are making accurate measurements. All of these statements, or some subset of these statements, can be included in ISO 9002 documentation as a description of the specific processes you use to ensure a certain level of performance. There are numerous other statements that can be included in ISO 9002 documentation; the ones listed below are merely examples to illustrate the types of statements that are acceptable.

- Twenty voltages and one resistance on the ASRU Card are calibrated once every six months. A traceable HP 3458 voltmeter is used to perform the calibration following the written procedure in the Service Manual, Theory and Repair II, Chapter 9, Maintenance.
- Confirmation, a software program that provides an operational verification of the system, is run daily by the first operator who uses the system, or at the beginning of each shift.

  Note: Confirmation can be run automatically at any desired interval by scheduling it into the HP-UX "cron" program. This option requires that every user be logged off the system during the automatically scheduled confirmation run. If it can be set up properly, it fits in well with the ISO 9002 philosophy. For more information, check with your local HP office.
- AutoAdjust, a software program that sets up a table of constants to optimize accuracy of the hardware, runs automatically whenever the temperature changes by 5 degrees C or after 1000 hours of controller operation.
- A golden board is tested by the system at the beginning of every shift. If it does not pass, the diagnostics program is run to determine if the system has a hardware fault.
- If three boards in a row fail in an identical manner, testing is stopped and the diagnostics program is run to determine if the system has a hardware fault.

Summary

The ISO 9002 standards can improve quality through improving the documentation and consistency of processes. The ISO audit checks for two very important items: the effectiveness of the processes themselves, and the degree to which all workers in the organization follow the processes. HP is committed to remaining certified to ISO 9002 and we look forward to working with our customers to meet their ongoing ISO 9002 needs.

The HP 3070 board test systems are not traceable according to Military Standard 45662A. However, standard reference voltages and a resistance on the ASRU card in the HP 307X should be calibrated every six months, which are then used to automatically derive all other system AutoAdjustment constants. The system Diagnostics and AutoAdjust routines constitute an overall system operational verification.

AutoAdjust is used to correct the voltage, resistance and timing values measured within the system.

Note: This is a dc and timing optimization only and not parametric in nature.

Companies whose quality systems comply with MIL-Q 9858, MIL-I-45208A, or MIL-STD-45662A already

have the majority of requirements in place. ISO 9002 standards, though, require more sophisticated cross-functional integration of your organization then is usually expected in a military standard audit.

After field calibration (by the traceable voltmeter) of the system ASRU cards, a sticker should be placed in a visible location on the front of the system indicating that the ASRU cards have been calibrated according to the Service Manual, Theory and Repair II, Chapter 9.

This sticker should be one agreed upon by the customer and HP, or whatever sticker the local area uses.

At no time should any other types of calibration/adjustment or functional verification stickers be placed on the board test system by HP personnel or the customer. Definitions on the use and meaning of any other type of stickers do not exist for Hewlett-Packard HP 3070 products and their use may lead to confusion later as to what service had been performed for the customer.

It is HP's position that the interconnect paths between the calibrated components of the system and the customer-accessible interfaces (fixture interface pins) do not require separate calibration procedures. Minor effects on the system measurement accuracy due to the interconnection paths have been eliminated by the system diagnostic programs and remote sensing techniques allowed for by the system design margins. System Confirmation and Diagnostic programs are used to obtain a high level of confidence in the overall system operation.

We assure correct system operation to the fixture interface pins. Any verification of measurement accuracy at contact to a device under test is the responsibility of the user.

All HP 3070 board test systems have been tested and calibrated at the Loveland Manufacturing Test Division of Hewlett-Packard to insure that all warranted specifications (referenced in the HP 3070 Board Test Family Test Methods & Specifications document P/N 5954-8683) are met at the time of shipment. Specifically, when the HP 307X testhead is shipped from the factory, the operation specifications have been verified by performance tests; this process is:

- Traceable to NIST (National Institute of Standards and Technology) standards.)
- Part of the LMC Quality System which is ISO 9002 approved.

The low level specifications (e.g., driver slew rate and receiver accuracy) have been verified with instruments calibrated by the Loveland Manufacturing Center's (LMC) ISO 9002 certified Electronic Maintenance facility. The Electronic Maintenance's instrument calibration procedures employ transfer standards traceable to NIST through the LMS Standards Lab.

The high-level specifications (e.g., component accuracy) have been verified by measuring the values of "calibrated" components. Special HP 3070 test fixtures containing the "calibrated" components are maintained by the Standards Lab. The fixtures are calibrated yearly.

A Certificate of Calibration is issued with every system to document that warranted specifications are met at the time of shipment. Calibration stickers are not affixed to the system upon delivery to the customer. □

1993 Bench Briefs' Instrument Service Note Index

HP FIRST (208)344-4809
T & M Section - Press 4
Password Section - Press 3
Password - 76683

SN Type	SN No.	Abstract	HP FIRST Document ID No.
MR	10762B-01	Switches S1, S2 and S3 may be subject to early failure	5871
MR	11713A-02	Modification reduces noise susceptibility	5886
MR	11729C-04	Retrofit instructions when replacing the AT2 isolator	5856
IO	11740A-01	Suggested external HP-IB filter replacement	5819
MA	11757B-02	New EEPROM/counter board eliminates spurs	5843
MA	11758U-01	New EEPROM/counter board eliminates spurs	5844
MA	11758V-01	New EEPROM/counter board eliminates spurs	5845
MR	11759C-01	Modification prevents fuse blowing in 220VAC operaton	5846

SN Type	SN No.	Abstract	HP FIRST Document ID No.
MR	11759D-01	Modification prevents fuse blowing in 220VAC operation	5847
SM	2813-1093-01	Info on repair of HP 2813A thru 2813E pressure probes	5899
IO	3047A-02	Suggested external HP-IB filter replacement	5814
IO	3048A-01	Suggested external HP-IB filter replacement	5815
IO	3048MS-01	Suggested external HP-IB filter replacement	5816
IO	3455A-29	Input capacitance specification change	5873
MR	3457A-16	Modification corrects self-test failures	5874
MR	3560A-01	F/W upgrade A.00.02 corrects S/W defects and adds enhancements	5892
MA	3562A-05B	Firmware upgrade kit improves performance	5273
MR	35653C-01	Rec mod will prevent oscillations in the 10 MHz range	5805
MR	35660A-05	New power switch improves reliability	5882
MR	35665A-01	New power switch improves reliability	5883
MR	35670A-01	Modification fixes sticking power supply switch	5893
IO	35670A-02	35670A is incompatible with new C1405B Vectra keyboard	5894
MR	3569A-01	Firmware upgrade A.00.03 corrects defects	5878
MR	3569A-02	Mod fixes spec failure "pressure residual intensity index"	5879
IO	3577A-11A	Ratio phase improved with padding caps after rec brd repair	5863
IO	3577A-16	A1 receiver board replaced by kit	5864
IO	3577B-05	A71 receiver board replaced by kit	5865
IO	3577B-06	Ratio phase improved with padding caps after rec board repair	5866
MR	3588A-06	New power switch improves reliability	5880
MR	3589A-02	New power switch improves reliability	5881
MR	37701A-04	Mod corrects automatic gain control problem on A6 assembly	5828
MR	37701A-05	New improved battery holder makes NVM battery repl easy	5829
MR	37701A-06	New firmware fixes fatal error 421 when printing Datacom Grph	5887
SM	37701A-0793-01	Option 003 retrofit instructions and pricing	5830
SM	37701A-0793-02	Option 004 retrofit instructions and pricing	5831
MR	37711A-04	Mod corrects automatic gain control problem on A6 assembly	5832
MR	37711A-05	New improved battery holder makes NVM battery repl easy	5833
MR	37711A-06	New firmware fixes fatal error 421 when printing Datacom Grph	5888
SM	37711A-0793-01	Option 004 retrofit instructions and pricing	5834
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MR	37721A-10	Modification to correct CCITT return loss specifications	5889
MR	37721A-11	New F/W fixes incorrect AIS status indication	5911
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MR	37732A-03	Mod fixes sig loss when X.21 LEASED I/O set for UNTERMINATED	5891
MR	37732A-04	New improved battery holder makes NVM battery repl easy	5837
SM	37732A-0793-01	Options 002 and 003 retrofit instructions and pricing	5838
SM	37732A-0793-02	Options 005 and 006 retrofit instructions	5839
MR	37743A-01A	Mod corrects incorrectly loaded cap on transmitter board	5698
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MR	42841A-04A	Rec mod prevents bias current source fuses from blowing	5405
IO	4396A-03	Repair procedure for A1 CPU	5790
IO	4396A-04	Firmware update procedures	5791
MR	4396A-05	Modification corrects A2 shutdown circuit malfunction	5792
MR	4396A-06	Mod prevents instrument from failing power on self tests	5793
MR	4396A-07	Mod prevents instrument from failing power on self tests	5794

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MA	4957PC-01B	Available option allows high speed option retrofitting	5253
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MR	5061B-05A	Rec IC replacement prevents failure of A11 oven controller	5787
IO	5071A-03A	Information on clearing serial port (RS-232C) hangups	5803
MR	5342A-60	A18 modification when A24Y1 changes from 0960-0394 to -0612	5854
MR	5343A-32	A18 modification when A24Y1 changes from 0960-0394 to -0612	5855
MR	54505B-02	Mod corrects waveform distortion between 240 and 255 MHz	5876
MR	54506B-02	Mod corrects waveform distortion between 240 and 255 MHz	5877
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IO	6012B-07	Suggested replacement printed circuit assemblies	5808
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MA	6632A-02	Bleeder resistor increases RFI filter capacitor discharge rate	5781
MA	6633A-02	Bleeder resistor increases RFI filter capacitor discharge rate	5782
MA	6634A-02	Bleeder resistor increases RFI filter capacitor discharge rate	5783
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MR	6652A-02B	Modification corrects relay link and eliminates error -240	5435
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MR	6672A-01B	Modification corrects relay link and eliminates error -240	5440
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SM	680-1093-01	Model 680 Charter Recorder replacement supplies	5885
MA	70004A-01A	Firmware Upgrade	5861
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MA	70320A-01A	RPP module modification reduces noise floor of RF output	5732
IO	70900A-28	A2 video board compatibility	5784
IO	70900B-06	A2 video board compatibility	5785
MA	8112A-04B	Rec repl of timing ICs require modifications	5503
MA	8116A-03A	Replacing 24 v supply fuses with jumpers improves reliability	5875
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MR	8560A-26B	Recommended replacement of 5-volt regulators	5739
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MA	8560E-04A	Firmware upgrade	5797
PS	8560E-05A-S	Shock hazard exists if analyzer is isolated from earth gnd	5778
MR	8561B-25B	Recommended replacement of 5-volt regulators	5741
MR	8561E-01B	Recommended replacement of 5-volt regulators	5742
MA	8561E-03A	Firmware upgrade	5798
PS	8561E-04A-S	Shock hazard exists if analyzer is isolated from earth gnd	5779
MR	8562A-67B	Recommended replacement of 5-volt regulators	5613
MR	8563A-20B	Recommended replacement of 5-volt regulators	5744
MR	8563E-02B	Recommended replacement of 5-volt regulators	5745
MA	8563E-04A	Firmware upgrade	5799
PS	8563E-05A-S	Shock hazard exists if analyzer is isolated from earth gnd	5780
MA	8563E-06	IF errors falsely displayed at cold temps before OCXO is warm	5858
MR	8568B-34	Mod corrects narrow bandwidth amplitude accuracy in zero span	5895
MR	8590D-02	Counter-lock assy mod improves marker count stability	5822
MR	8591E-02	Counter-lock assy mod improves marker count stability	5823
MR	8593E-02	Counter-lock assy mod improves marker count stability	5824
MR	8594E-02	Counter-lock assy mod improves marker count stability	5825
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MA	8643A-01A	RPP module modification reduces noise floor of RF output	5721
MA	8644A-04	RPP module modification reduces noise floor of RF output	5840
MA	8644B-01A	RPP module modification reduces noise floor of RF output	5725
MA	8645A-02A	RPP module modification reduces noise floor of RF output	5727
MR	8711A-04	Resistor modification fixes intermittent memory loss	5908
MR	8751A-06C	Mod fixes the A4 (Rev. E or below) power-on test failure	5037
IO	8751A-23	Individual internal tests verify the self diagnosis failure	5905
IO	8770A-25	Information on the HP-IB retrofit kit	5804
MR	8780A-14	Modification prevents premature output amplifier failures	5842
IO	8904A-05	Procedure for restoring RAM data	5872
MR	8920A-09	Rec mod corrects tone/digital signaling functionality	5817
MR	8920A-10	New F/W A.10.07 corrects erroneous self test diag results	5909
MR	8921A-02	Rec mod corrects tone/digital signaling functionality	5818
MR	8921A-03	New F/W A.10.07 corrects erroneous self test diag results	5910
MR	89410-05	Metal chips caused by card nest screws may cause failure	5867
MR	89410A-03	Mod prevents ADC short to heat sink which causes calib fail	5795
MR	89410A-04	Ext DIN keyboard failure caused by analyzer's slow power up	5820
MR	89430A-01	New power switch improves reliability	5884
MR	89440-05	Metal chips caused by card nest screws may cause failure	5868
MR	89440A-03	Mod prevents ADC short to heat sink which causes calib fail	5796
MR	89440A-04	Ext DIN keyboard failure caused by analyzer's slow power up	5821
MR	E1301A-05	Modification improves module installation into MF slots	5862
MR	E1401A-03	Modification to ensure mainframe meets emission standards	5848
MR	E1401A-04	Mod corrects difficult instal of some modules in MF slots	5857
MA	E1420B-02A	New F/W Rev B.03.00 and B.03.40	5788
IO	E1468A-01	Status register switch added to configure the product	5902
IO	E1469A-01	Status register switch added to configure the product	5903
MR	E1485A/B-01	New RFI gaskets and insulator prevent shorts to main board	5906
MR	E1485A/B-02	New brd prvnts MODID fails and lock-ups during pwr up tests	5907
IO	E1750A-01	Amplifier servicing instructions	5859

SN Type	SN No.	Abstract	HP FIRST Document ID No.
IO	E1752A-01	Amplifier servicing instructions	5860
IO	E2500B-08A	Changes to performance test software for pulse on/off tests	5752
IO	E2505A-02A	Changes to performance test software for pulse on/off tests	5754
MR	E3610A-02	Mod eliminates V transient above output set during turn-off	5849
MR	E3611A-02	Mod eliminates V transient above output set during turn-off	5850
MR	E3612A-02	Mod eliminates V transient above output set during turn-off	5851
MR	J2208B-01	Modification instructions for main board/A1 assembly	5869
MR	J2213A-02	Main board/A1 assembly - additional 1 Meg DRAM	5870

Service Note Types

IO	Information Only	MA	Modification Available
MR	Modification Recommended	SA	Safety
PS	Priority Safety	SM	Interoffice Service Memo (IOSM)

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